a process can be brought under observation, and how this is to be effected, are, of course, questions which, on the argument of the English authors, fall to be answered by those who undertake the direct proof of the existence of the corpuscles. And whatever opinion one may form of the stringency and fitness of this demand, it involves no logical contradiction, which is the very point on which the argument must turn if Mr. Zöllner is to make good his case.

I will mention one other objection of similar scientific value, because it refers to Sir W. Thomson, though not to a passage of this book. The point in question is whether it is possible for organic germs to be present in meteoric stones, and so to be conveyed to worlds which have become cool. In his introductory address to the British Association at Edinburgh, in the autumn of 1871, Sir W. Thomson characterised this view as "not unscientific." Here, too, if an error has been committed, I must profess myself a sharer in it. I had, in fact, indicated the same view as a possible explanation of the transmission of organisms through interstellar spaces at a somewhat earlier date than Sir W. Thomson—in a lecture which was delivered at Heidelberg and at Cologne in the spring of the same year, but is still unpublished. If anyone chooses to regard this hypothesis as highly or even as extremely improbable, I have nothing to object. But if failure attends all our efforts to obtain a generation of organisms from lifeless matter, it seems to me a thoroughly correct scientific procedure to inquire whether there has ever been an origination of life, or whether it is not as old as matter, and whether its germs, borne from one world to another, have not been developed wherever they have found a favourable soil. The physical reasons alleged by Mr. Zöllner against the view in question are of very little weight. He points to the heating of the meteoric stones, and adds (p. 26): "Thus, even if we suppose that when the parent body was shattered, the meteoric stone covered with organisms escaped with a whole skin, and did not share the general rise of temperature, it was still necessary for it to pass through the terrestrial atmosphere before it could discharge its organisms to people the earth."

Now, in the first place, we know from oft-repeated observations that of the larger meteoric stones only the very surface is heated in passing through the atmosphere, the inner portions remaining cold, or even very cold. All germs, therefore, that happened to be in cracks of the stone would be protected from combustion in our atmosphere. But even germs lying on the surface would doubtless, when they entered the very highest and most attenuated strata of the earth's atmosphere, be blown away by the powerful current of the air long before the stone reached the denser parts of the gaseous mass, where the compression becomes great enough to generate considerable warmth. And on the other hand, with regard to the collision of two worlds as assumed by Thomson, the first consequences of such an event would be violent mechanical motions, while heat would be generated only in proportion as these motions were destroyed by friction. We do not know if this would last for hours, or days, or weeks. The fragments, therefore, projected in the first instant with planetary velocity might escape without any development of heat. I do not even think it impossible that a stone, or swarm of stones, flying through lofty strata of the atmosphere of a world might catch up and sweep along a quantity of air containing unburnt germs.

I have already said that I should not yet be willing to put forth all these possibilities as probabilities. They are only questions the existence and range of which must be kept in view, so that if opportunity offers they may be solved by actual observation or by inferences from such.

Mr. Zöllner then ascends to the two following propositions :—

"That scientific investigators in the present day attach such extraordinary importance to *inductive proof* of *generatio æquivoca*, is the clearest mark of their lack of familiarity with the first principles of the theory of knowing."

And again :—

"In like manner the hypothesis of *generatio æquivoca* expresses . . . nothing else than the condition for the conceivableness of nature in accordance with the law of causality."

Here we have the genuine metaphysician. In view of a presumed necessity of thought, he looks down with an air of superiority on those who labour to investigate the facts. Has it already been forgotten how much mischief this procedure wrought in earlier stages of the development of the sciences? And what is the logical basis of this lofty standpoint? The correct alternative is clearly this :—

"Either organic life began to exist at some particular time, or it has existed from all eternity."

Mr. Zöllner simply omits the second of these alternatives, or thinks that he has set it aside by a passing reference brought in shortly before to certain physical considerations which are not in the least decisive. Accordingly his conclusion, which affirms the first of the alternatives above stated, is either not proved at all, or proved only by the aid of a minor resting on physical arguments (and, for that matter, inadequate physical arguments). The conclusion, therefore, is not in any sense, as Mr. Zöllner believes, a proposition of logical necessity, but at most an uncertain inference from physical considerations.

This is what Mr. Zöllner has to object to the authors of this handbook in the sphere of scientific questions.* Mr. Zöllner's book contains a great number of other accusations of precisely the same value directed against other scientific investigators, with the same confidence in his own infallibility and the same rash haste in passing judgment on the intellectual and moral qualities of his antagonist. Another opportunity will present itself for the discussion of another part of these cases. If I may draw by anticipation a moral interesting to us in the present connection, I would say that no theoretical arguments can present to the attentive and judicious reader a stronger and more eloquent justification of the strict discipline of the inductive method, the loyal adhesion to facts which has made science great, than is supplied by the practical example of the consequences of the opposite, would-be deductive, or speculative method given in Zöllner's book; and this all the more that Mr. Zöllner is beyond question a man of talent and knowledge, who did most promising work before he fell into metaphysics, and even now shows acuteness and the faculty of invention whenever he is limited to the field of the actual, *e.g.* in the construction of optical instruments and the devising of optical methods.

NEW ZEALAND PLANTS SUITABLE FOR PAPER-MAKING

THE utilisation of waste materials for paper-making is a subject upon which a great deal has been said and still remains to be said and done. In every country waste vegetable matter which contains fibre in anything like suitable proportions is sure to attract much attention. The subject has been handled in various works, directly or indirectly, in this country as well as on the Continent; and with regard to Australian plants suitable for paper-making, Baron Mueller, of Melbourne, issued a lengthy treatise in connection with a series of specimens of paper actually made from the plants enumerated and exhibited in the Paris Exhibition of 1867. We have now before us a paper by Mr. T. Kirk, F.L.S., of Wellington, on

* In the region of personal questions, and with reference to the claim of priority as to the principles of spectral analysis made by Sir W. Thomson for Mr. Stokes against Mr. Kirchhoff, I must side with the latter, fully agreeing with the reasons which he has himself brought forward.

some indigenous materials of New Zealand suitable for the manufacture of paper. The plants enumerated occur in great abundance in different parts of the colony, and, it is said, are being yearly destroyed to an enormous extent by the progress of settlement. Most of the plants alluded to in this paper belong to the endogenous group, Liliaceæ and Cyperaceæ being the chief natural orders. In the genus Astelia a group of small tufted sedge-like plants belonging to the first-named order, five species of which are described as occurring in New Zealand, four are recommended, both on account of the quantity of fibre contained in their leaves, as well as for the abundance with which the plants grow. *A. Solandri*, the Tree-flax of the colonists, is a plant with numerous radical leaves, from one to two feet long, thickly clothed at the base with shaggy silky hairs, and containing a quantity of good fibre. It is abundant on lofty trees and rocks throughout the colony, resembling in the distance the nest of some large bird. "Hundreds of tons" of this plant, it is said, "are destroyed on every acre of forest-land cleared in the North Island."

A. Banksii and *A. Cunninghamii*, both of which have a similar habit to the first-named species, but with narrower and much longer leaves, sometimes from three to six feet in length, produce a superior fibre. The first is found in great abundance in wooded places near the sea, and the latter is common on trees and rocks. Both are abundant in the North Island, "but their southern distribution is uncertain."

A species of Astelia, known as the Kauri Grass, and called by Mr. Kirk *A. trinervia*, is said to be "the most abundant of all the species, occasionally forming the chief part of the undergrowth in the northern forests up to 3,000 ft., and so dense that it is often difficult to force one's way amongst the interlaced leaves, which are from three to eight feet long, and of a paler green tinge than either of the preceding. It could be procured by hundreds of tons, and as, like other species, it is found in situations not adapted for ordinary cultivated crops, a permanent supply might be fairly calculated upon. Experience has shown that it may be cut yearly."

In the allied genus Cordyline, which is composed of shrubby or small palm-like trees, the Ti, or cabbage-tree (*C. australis*), is the most important. It attains the greatest height of any of the New Zealand species, averaging from ten to twenty or even thirty feet, and producing a trunk usually from ten to eighteen inches in diameter, but sometimes even three feet across. The plant is very abundant in many districts, and the leaves contain a very large quantity of fibre. *C. Banksii*, a smaller growing species, with a trunk from five to ten feet high, produces a fibre of superior quality, but less abundant; the plant, however, is very plentiful on the margins of forests, gullies, &c., all over the North Island, and in the northern parts of the South Island.

That the leaves of the Cordylines are suitable for paper-making there can be no doubt. In appearance, when dry, they very much resemble the so-called palmetto leaves which have recently been brought into this country from America for the purpose of competing with esparto. These palmetto leaves are those of one or more species of Chamærops, perhaps *C. serrulata*, which is known in some parts of the Southern States as the Saw Palmetto. The leaves of *Cordyline australis* are not altogether unknown in Europe as a paper material, for it appears that some years since a quantity was sent to England from New Zealand specially for trial, and were made into paper at a mill in Yorkshire: at that time the leaves were highly recommended for the manufacture of a superior kind of paper. A leaf somewhat similar, but generally of softer texture, is that of the genus Freycinetia. *F. Banksii*, known as the New Zealand Screw Pine, is abundant in most woods, and it is said that the leaves might be procured by thousands of tons. *Gahnia setifolia*, which is abundant in both islands and capable of being procured in almost unlimited quantity, is recommended for the manufacture of coarse paper. The Gahnias are a group of tall-growing, coarse, rigid cyperaceous plants, with long, harsh, cutting leaves, from which fact the plants are known in some parts of the colony as "cutting grasses." The genus is distributed through New Zealand, Australia, Tasmania, the Malayan and Pacific Islands.

The large order Compositæ, containing as it does such a variety of plants, from trees down to shrubs and herbs, might be expected to include many whose woolly foliage would prove useful for paper-making. The genus Celmisia, however, is the only one mentioned in the paper under consideration; the species are perennial bulbs, with radical, rosulate, simple leaves, mostly covered with a white or buff-coloured tomentum, which gives them a leathery texture, and hence the plants are called Leather-plants, or Cotton-grass. The commonest species in the islands is *C. longifolia*, which ascends to an elevation of 5,500 feet, and varies much in height, length, and breadth of leaves, as well as in general robustness. *C. verbascifolia* is a fine species, with broad coriaceous leaves averaging from four to eight inches long, but, according to Mr. Kirk, growing sometimes to a length of two feet. *C. coriacea* is likewise an abundant species, with thick leaves from ten to eighteen inches long, and from half an inch to two-and-a-half inches broad, covered on their upper surface with matted silvery hairs, and on the other with thick silvery tomentum. These leaves are said to make a good paper material; it is certain that when dry they are very tough, and the natives make them into strong and durable cloaks.

The plants here enumerated are only a few of those considered likely to prove valuable in the colony for paper material; they are selected because of their being little or perhaps not at all known for economic uses. Such well-known plants as the New Zealand Flax (*Phormium tenax*) are passed by with a simple mention of the fact that a company has recently been formed in Auckland, specially for utilising its fibre in the manufacture of paper.

While on the subject it may not be quite out of place to mention, in reference to the notice on the use of *Zizania aquatica*, in NATURE, vol. xi. p. 33, that several of the North American daily papers, as the *New York Tribune*, *Montreal Gazette*, &c., are printed on paper made entirely from this plant, and that the promoters of its use in England propose to bring it to this country in the form of half-stuff, to save expense of freight.

JOHN R. JACKSON

A FRENCH OFFICIAL ACCOUNT OF THE ORIGIN OF THE ROYAL SOCIETY

WE find in the first volume of the "Memoirs of the French Academy" a few curious details relating to this subject which may be of some interest to our readers. We translate the text *verbatim*, with the addition of a few explanatory remarks. These details were originally published in Latin, by the first perpetual secretary of the Academy, and may therefore be considered as official.

"Full fifty years had elapsed (in 1666) since the learned men who lived in Paris began to meet at the abode of Father Mersenne, who was the friend of the most learned men in Europe, and was pleased to be the centre of their mutual visits.* MM. Gassendi, Descartes, Hobbes, Roberval, Pascal (father and son), Blondel, and some others met at this place (close to the Place Royale, in a convent). The assemblies were more regularly held at M. de Montmort's, Master of Request in Parliament (and

* Father Mersenne was the intimate friend of Descartes, and his philosophical propagandist. It was not deemed prudent by the writer to mention Descartes' name, except as coupled with others.